Specifications

Frequency Range and Attenuation

Product	8494A	8494B	8495A	8495B	8496A	8496B
Frequency Range	dc to 4 GHz	dc to 18 GHz	dc to 4 GHz	dc to 18 GHz	dc to 4 GHz	dc to 18 GHz
Attenuation	0 dB to 11 dB	0 dB to 11 dB	0 dB to 70 dB	0 dB to 70 dB	0 dB to 110 dB	0 dB to 110 dB
Steps	1 dB	1 dB	10 dB	10 dB	10 dB	10 dB

Attenuation Accuracy (dB): (Referenced from 0 dB)

8494A/B	8495A/B 8496A/B	8494A	8494B		8495A	8495B		8496A	8496B	
Attenuation Selection (dB)		dc–4 GHz	dc–12.4 GHz	12.4–18 GHz	dc–4 GHz	dc–12.4 GHz	12.4–18 GHz	dc–4 GHz	dc–12.4 GHz	12.4–18 GHz
1	10	0.2	0.3	0.7	0.2	0.5	0.6	0.2	0.5	0.6
2	20	0.2	0.3	0.7	0.4	0.7	0.8	0.4	0.7	0.8
3	30	0.3	0.4	0.7	0.5	0.9	1.2	0.5	0.9	1.2
4	40	0.3	0.4	0.7	0.7	1.2	1.6	0.7	1.2	1.6
5	50	0.3	0.5	0.7	0.8	1.5	2.0	0.8	1.5	2.0
6	60	0.3	0.5	0.8	1.0	1.8	2.4	1.0	1.8	2.4
7	70	0.4	0.6	0.8	1.2	2.1	2.8	1.2	2.1	2.8
8	80	0.4	0.6	0.8	-	-	-	1.3	2.4	3.2
9	90	0.4	0.6	0.8	-	-	-	1.5	2.7	3.6
10	100	0.4	0.6	0.9	-	-	-	1.6	3.0	4.0
11	110	0.5	0.7	0.9	-	-	-	1.8	3.3	4.4

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Maximum SWR

Instrument	Frequency Range (GHz)	Maximum SWR
8495A	dc to 4	1.35
8495B	dc to 8 8 to 12.4 12.4 to 18	1.35 1.5 1.7
8494A, 8496A	dc to 4	1.5
8494B, 8496B	dc to 8 8 to 12.4 12.4 to 18	1.5 1.6 1.9

Maximum Residual Attenuation

Instrument	Maximum Residual Attenuation
8494A, 8494B	0.6 dB + 0.09 dB/GHz
8495A, 8495B	0.4 dB + 0.07 dB/GHz
8496A, 8496B	0.6 d8 + 0.09 dB/GHz

Attenuation Repeatability

0.01 dB typical after 5 million cycles

RF Power Handling Capability

1 W average, 100 W peak with maximum pulse width of 10 microseconds (all models)

Minimum Life

> 5 million cycles per section

Environment Limits

The instrument should be stored in a clean, dry environment. The following environmental limits apply to storage and shipment, and operation.

Characteristic	Storage and Shipping Value	Operating Value
Temperature	–40 to +75 °C	0 to +55 °C
Humidity	< 95% relative	< 95% relative
Altitude	< 7600 m (25000 ft)	< 4600 m (15000 ft)

Physical Characteristics

Instrument	Dimensions [1] (depth x width x height)	Weight [2]
8494A/B	6.25 in x 2.875 in x 1.6875 in 159 mm x 73 mm x 43 mm	15 oz 425 g
8495A/B	5.125 in x 2.875 in x 1.6875 in 130 mm x 73 mm x 43 mm	11 oz 312 g
8496A/B	6.25 in x 2.875 in x 1.6875 in 159 mm x 73 mm x 43 mm	15 oz 425 g

1. Dimensions are for general information only. If dimensions are required for building special enclosures, contact your Agilent field engineer.
2. Weight and width of the instrument varies with the option selected due to the type of connectors.

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Specifications

Specifications describe the instrument's warranted performance. Supplemental characteristics are intended to provide information useful in applying the instrument by giving typical, but non-warranted, performance parameters. These are denoted as "typical", "nominal", or "approximate".

Electrical

Attenuation Accuracy (±dB Referenced from 0-dB Setting):

HP Models 33320A/B/G/H (11 dB max*)											
Frequency Range	Attenuator Setting (dB)										
	1	2	3	4	5	6	7	8	9	10	11
dc–4 GHz (A, G only)	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5
dc–12.4 GHz (B, H only)	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7
12.4–18.0 GHz (B, H only)	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9
*Typical step-to-step accuracy is ±0.2 dB to 18 GHz.											

HP Model Numbers	33321A/B/G/H (70 dB max*)										
	33322A/B/G/H (110 dB max*)										
Frequency Range	Attenuator Setting (dB)										
	10	20	30	40	50	60	70	80	90	100	110
dc–4 GHz (A, G only)	0.2	0.4	0.5	0.7	0.8	1.0	1.2	1.3	1.5	1.6	1.8
dc–12.4 GHz (B, H only)	0.5	0.7	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3
12.4–18.0 GHz (B, H only)	0.6	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4
*Typical step-to-step accuracy is ±1 dB to 18 GHz.											

HP Models 33321D/K (70 dB max*)							
Frequency Range	Attenuation Setting (dB)						
	10	20	30	40	50	60	70
dc–12.4 GHz	0.6	0.7	0.9	1.8	2.0	2.2	2.3
12.4–18.0 GHz	0.7	0.9	1.2	2.0	2.3	2.5	2.8
18.0–24.0 GHz	0.9	1.5	2.5	3.0	3.2	3.3	3.5
24.0–26.5 GHz	1.0	2.5	3.0	4.2	4.4	4.6	4.8
*Typical step-to-step accuracy is ±1 dB to 18 GHz. ±2 dB to 26.5 GHz.							

HP Model 33323K (90 dB max*)									
Frequency Range	Attenuation Setting (dB)								
	10	20	30	40	50	60	70	80	90
dc - 6.0 GHz	0.3	0.5	0.6	0.7	0.8	1.0	1.1	1.1	1.2
6.0 - 12.4 GHz	0.4	0.5	0.7	0.9	1.0	1.3	1.5	1.6	1.7
12.4-18.0 GHz	0.5	0.6	0.8	1.1	1.2	1.4	1.7	1.8	2.1
18.0-26.5 GHz	0.7	0.8	1.0	1.5	1.6	1.9	2.3	2.5	2.8
*Typical step-to-step accuracy is ± 0.6 dB to 18 GHz ±0.9 to 26.5 GHz.									

To insure warranted specifications for the HP 33321K, and HP 33323K, the following combination of sections is recommended.

Attenuation (dB)	10	20	30	40	50	60	70	80	90
HP 33321K	1	4	1, 4	2, 4	1,2,4	2,3,4	1, 2, 3, 4	—	—
HP 33323K	1	2	4	1, 4	2, 4	3, 4	1,3,4	2,3,4	1, 2 3, 4

SWR (Characteristic Impedance: 50 ohms)

HP Model	Frequency (GHz)				
	dc - 4	4 - 8	8 - 12.4	12.4 - 18	18 - 26.5
33320A/G 33322A/G	1.5 1.5	— —	— —	— —	— —
33320B/H 33322B/H	1.5 1.5	1.5 1.5	1.6 1.6	1.9 1.9	— —
33321A/G	1.35	—	—	—	—
33321B/H	1.35	1.35	1.5	1.7	—
33321D/K	1.6	1.6	1.6	1.9	2.2
	dc - 6		dc - 12.4		
33323K	1.25		1.45	1.6	1.8

Attenuation Temperature Coefficient: Less than 0.0001 dB/dB/°C.

Power Sensitivity: 0.001 dB/watt.

RF Input Power (max.): 1 watt average, 100 watts peak (10 μs pulse width).

Life, Minimum: 5 million cycles per section.[1]

Repeatability: 0.01 dB, typical to 18 GHz, 0.05 dB, typical to 26.5 GHz.

Insertion Loss (0 dB position, f is frequency in GHz):

HP 33320A/B/G/H: (0.6 + 0.09 x f) dB

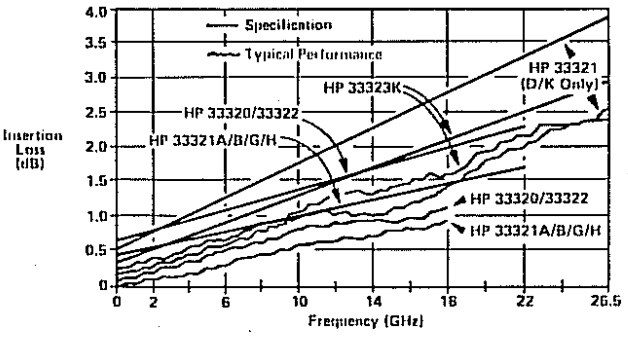
HP 33321A/B/G/H: (0.4 + 0.07 x f) dB

HP 33321D/K: (0.5 + 0.13 x f) dB

HP 33322A/B/G/H: (0.6 + 0.09 x f) dB

HP 33323K: (0.4 + 0.09 x f) dB

[1]A cycle is defined as switching from the thru-line position to the attenuation card and back to the thru-line position or vice versa.



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Specifications

Environmental Capabilities*

Temperature, Operating: -20° to +75°C.
Temperature, Non-Operating: -55°C to +85°C.
Altitude, Operating: 15,000 ft.
Altitude, Non-operating: 50,000 ft.
Humidity: Cycling 5 days, 40°C at 95% RH with condensation.
Shock, Operating: 10 g's, 6 ms, on six sides, three blows.
Shock, Non-operating: 500 g's, 1.8 ms, in 6 directions.
Vibration, Operating: 5 g's, 34–2000 Hz (for all models except the HP 33321D/K); 0.015 inches DA, 5-55 Hz (for the 33321D/K only).
EMC: radiated interference is within the requirements of MIL-STD-461 method RE02, VDE 0871 and CISPR Publication II.

*Additional environmental data provided on request.

Mechanical

Mounting Position: Any.
Net Weight:
HP 33321 / HP 33323 A/B: 198 grams (7 oz); G/H: 227 grams (8 oz); D: 255 grams (9 oz); K: 284 grams (10 oz).
HP 33320 / HP 33322 A/B: 255 grams (9 oz); G/H 284 grams (10 oz).

RF Connectors: SMA female for HP 33320/1/2 A/B/G/H. APC-3.5 female (SMA compatible) for HP 33321D/K & HP 33323K.

Programmable Models (G, H, K)

Switching Speed: Max. 20 msec including settling time.

Solenoids	Coil Voltage	Switching Current*	Nominal Coil Impedance
Standard (G, H, and K models)	24V (20 - 30V)	125 mA (@ 24V)	190Ω (65 mh)
Option 011 (G & H models plus HP33323K)	5V (4 - 7V)	300 mA (@ 5V)	17Ω (5.5 mh)

*Current per section; appoximately 8 msec duration before internal contacts open the coil circuit.

Accessory provided (except Option 008 & 016 on HP 33323K). Solenoid drive plug on 5-foot cable included with programmable models. (Replacement plug and cable assembly available as HP Part Number 8120-2178.)

Step Attenuator Selection Guide

To order, basic model number and suffix letter must be specified. The basic model number defines the step size and maximum attenuation value. HP 33320 (1-dB step, 11-dB max.) HP 33321 (10-dB step, 70-dB max.), HP 33322 (10-dB step, 110-dB max.), HP 33323 (10-dB step, 90 dB max.). The suffix letter denotes frequency range and switching mode (manual or programmable); A, B, and D denote dc — 4 GHz, dc — 18 GHz, and dc —26.5 GHz respectively for the manual models; G, H, and K denote dc — 4 GHz, dc —18 GHz, and dc — 26.5 GHz respectively for the programmable models. Standard coils are 24 volt, Option 011 specifies 5 volt.

Attenuation Step Size	Attenuation Range	Frequency Range	Switching Mode (Manual or Programmable)	HP Basic Model Number
1 dB	0–11 dB	dc–4 GHz	MAN.	33320A
			PROG.	33320G
		dc–18 GHz	MAN.	33320B
			PROG.	33320H
10 dB	0–70 dB	dc–4 GHz	MAN.	33321A
			PROG.	33321G
		dc–18 GHz	MAN.	33321B
			PROG.	33321H
		dc–26.5 GHz	MAN.	33321D
			PROG.	33321K
	0–90 dB	dc–26.5 GHz	PROG.	33323K
	0–110 dB	dc–4 GHz	MAN.	33322A
			PROG.	33322G
		dc–18 GHz	MAN.	33322B
			PROG.	33322H

Ordering Information

Specify basic model number and suffix, per the table above.

Option 008: (HP 33323K only) 8 inch (20.3 cm) ribbon cable with 14 pin flat pack male connector. (See back page.)
Option 016: (HP 33323K only) 16 inch (40.6 cm) ribbon cable with 14 pin flat pack male connector (see back page.)
Option 011: 5 volt solenoid operation. (Not available on HP 33321K.)
Option 890: Calibration data:
4 GHz models: 20 frequencies
18 GHz models: 90 frequencies
26.5 GHz models: 101 frequencies